SIEMENS

Industrial Communication

Industrial Ethernet Switches SCALANCE X-300

Operating Instructions

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01
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Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.

Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.

Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

1

Purpose of the Operating Instructions

These Operating Instructions describe the functions of the compact Industrial Ethernet Switches of the SCALANCE X-300 product line and support you during installation, commissioning, and troubleshooting on site.

You will find information on configuring in the separate *SCALANCE X-300 and SCALANCE X-400 Configuration Manual*.

"Operating Instructions (compact)" are also supplied with the product.

Validity of the Operating Instructions

These operating instructions are valid for the following products:

- Industrial Ethernet Switch SCALANCE X310
  order number: 6GK5 310-0FA00-2AA3
- Industrial Ethernet Switch SCALANCE X308-2
  order number: 6GK5 308-2FL00-2AA3
- Industrial Ethernet Switch SCALANCE X308-2 LD
  order number: 6GK5 308-2FM00-2AA3

Names of the devices in these operating instructions

The descriptions in these operating instructions always apply to the compact Industrial Ethernet Switches of the SCALANCE X-300 product line listed under "Validity of the Operating Instructions" in this document unless the description relates to a specific device of the product line. In the remainder of the description, the devices are called **IE Switches X-300**.

Further documentation

For help on configuration and diagnostics using Web-based management, the CLI command line, or SNMP, refer to the following documentation:

- SCALANCE X-300 SCALANCE X-400 Configuration Manual
  C79000-G89xx-C187-06
  (xx = German 00, English 76, French 77, Italian, 72 Spanish 78)
  This configuration manual is available on the following media:
  - On the supplied CD
  - On the Internet at the address
    http://support.automation.siemens.com/WW/view/xx/19625108
    (xx = German 00, English 76, French 77, Italian 72, Spanish 78)

- SIMATIC NET Twisted Pair and Fiber Optic Networks
  This manual is available on the following media:
  - In paper form under the order number C79000-G89xx-C125
    (xx = German 00, English 76, French 77, Italian 72, Spanish 78)
  - On the Internet at the address
    http://support.automation.siemens.com/WW/view/xx/8763736
    (xx = German de, English en, French fr, Italian it, Spanish es)

Standards, certificates and approvals

The devices of the SCALANCE X-300 product line meet the requirements for the CE mark. For more detailed information, refer to the section "Approvals" in these Operating Instructions.

Description 2

2.1 Basic information on Ethernet switching

Ethernet switching

Ethernet switches forward data packets directly from the input port to the appropriate output port during data exchange based on the address information. Ethernet switches operate on a direct delivery basis.

Essentially, switches have the following functions:

- Connection of collision domains / subnets
  Since repeaters and star couplers (hubs) operate at the physical level, their use is restricted to the span of a collision domain. Switches connect collision domains. Their use is therefore not restricted to the maximum span of a repeater network. On the contrary, extremely large networks with very large spans are possible with switches. The distances achieved depend on the fiber-optic interfaces used in the devices and the FO fibers used (see technical specifications).
- Containing load
  By filtering the data traffic based on the Ethernet (MAC) addresses, local data traffic remains local. In contrast to repeaters or hubs, which distribute data unfiltered to all ports / network nodes, switches operate selectively. Only data intended for nodes in other subnets is switched from the input port to the appropriate output port of the switch. To make this possible, a table assigning Ethernet (MAC) addresses to output ports is created by the switch in a “teach-in" mode.
- Limiting errors to the affected subnet.
  By checking the validity of a data packet on the basis of the checksum which each data packet contains, the switch ensures that bad data packets are not transported further. Collisions in one network segment are not passed on to other segments.

The need for Industrial Ethernet switches

With over 95% of LANs based on Ethernet, this is the most commonly used technology. The use of switches is particularly important: They allow extensive networks with large numbers of nodes to be set up, increase the data throughput, and simplify network expansion.

The IE Switches X-300 from SIMATIC NET are designed for use in high-speed plant networks that will also meet future requirements. With the HSR redundancy function and standby coupling of rings, high network availability can be achieved. Support of IT standards such as VLAN, RSTP, IGMP, and GARP makes seamless integration of automation networks in existing office networks possible.

The IE Switches X-300 are designed for use in switching cubicles and cabinets.

Technical options (network topologies)

The IE Switches X-300 simplify the expansion of a network regardless of the network topology.

You can use an IE Switch X-300 in the following network topologies:

- Linear structure
- Star/tree structure
- Ring with redundancy manager

The maximum cable length is 10 km for single mode gigabit transmission. A mixed topology between IE Switch X-300s and OSMs/ESMs is possible on the optical ports. Mixed operation in the topology between SCALANCE X308-2 and an OSM over the optical ports is not possible because the SCALANCE X308-2 only supports gigabit.

Using an IE Switch X-300 as the redundancy manager in a ring with redundancy manager provides greater availability. If there is an interruption on the connection between these switches, the IE Switch X-300 used as redundancy manager acts like a switch and in a very short time creates a line from the ring with redundancy manager. As a result, a functional, end-to-end structure is restored. For information on this topic, refer to the Configuration Manual "SIMATIC NET; Industrial Ethernet Switches SCALANCE X-300 SCALANCE X-400."

2.1.1 Linear structure

Functional description

Linear structures can be created with the IE Switches X-300. The cascading depth and total span of a network are limited only by the signal propagation times of the communication connections.

Properties of the linear structure

Each IE Switch X-300 communicates over a TP or FO cable with a neighboring Ethernet switch. Communication is possible over the optical or the electrical ports.

Configuration example

Sample configuration with SCALANCE X308-2, SIMATIC S7-300/400 and operator panel as end devices.

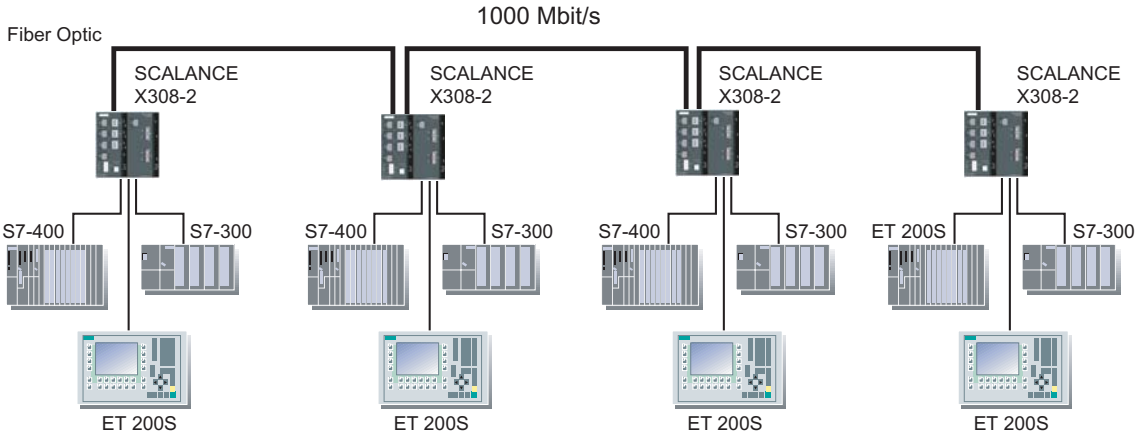


Figure 2-1 Linear structure (optical)

2.1.2 Star/tree structure

Functional description

Star/tree structures can be created with the IE Switches X-300. The cascading depth and total span of a network are limited only by the signal propagation times of the communication connections.

Properties of a star structure

Each IE Switch X-300 communicates over a TP or FO cable with a central switch with which all other switches are also connected within a star structure. Communication is possible over the optical or the electrical ports.

Configuration example

Sample electrical configurations with SCALANCE X310, SCALANCE X-200, SIMATIC S7-300/400, SIMATIC ET 200, and operator panels as end devices.

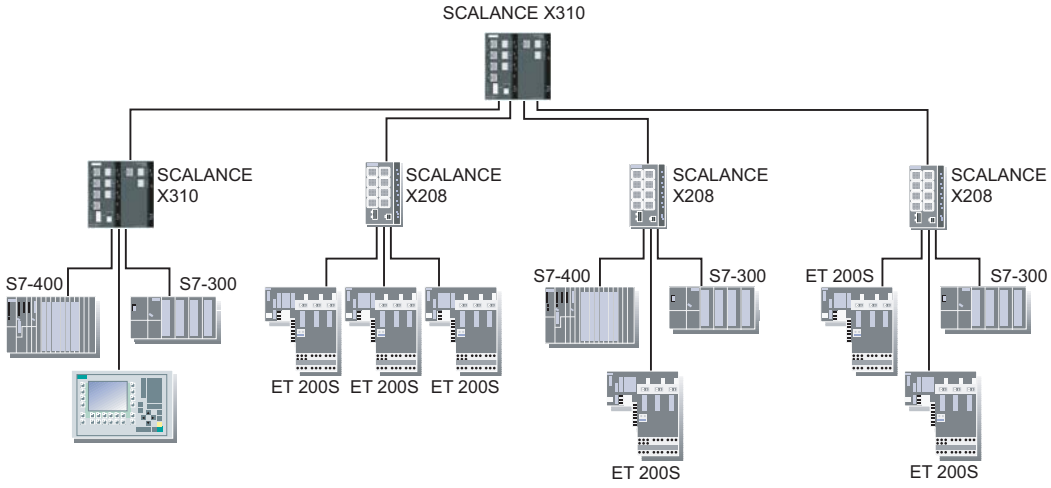


Figure 2-2 Star structure (electrical)

2.1.3 Ring with redundancy manager

Ring with redundancy manager

To increase availability, linear (bus) topologies of up to 50 switches can be closed to form a ring:

- Optical: SCALANCE X-400, SCALANCE X-300
- Electrical: SCALANCE X-400, SCALANCE X-300, SCALANCE X-200 or ESM

Functional description

The two ends of the bus are closed to form a ring by an IE Switch X-300 operating as a redundancy manager.

The redundancy manager function is enabled by the SELECT/SET button or implemented by a setting in the software.
For more detailed information, refer to the configuration manual "Industrial Ethernet Switches SCALANCE X-300 SCALANCE X-400."

In contrast to the ring ports of the other IE Switches X-300, the ring ports of the redundancy manager are disconnected when the network is operating problem-free. The IE Switch X-300 operating in the redundancy manager mode monitors the connected bus over its ring ports and switches the ring ports through if there is an interruption on the connected bus; in other words, it restores a functioning bus over this substitute path. Reconfiguration is achieved

within 0.3 s. As soon as the problem is eliminated, the original topology is restored; in other words, the ring ports in the redundancy manager are disconnected from each other again.

In a ring with redundancy manager, there can only be one IE switch configured as a redundancy manager.

(Defaults are ports 9 and 10. Both the RM and the IE switches in the ring must be connected over these ring ports to allow redundancy to function.)

Electrical ring ports

An electrical ring with redundancy manager can be set up since the device provides connectors (RJ-45 jacks) that allow attachment of electrical (twisted pair) connections (10, 100, 1000 Mbps). The factory setting defines the two ports no. 9 and 10 as ring ports. The ring ports can, however, be reconfigured individually.

Optical ring ports (1000 Mbps)

An optical ring with redundancy manager requires the use of SCALANCE X308-2, X308-2 LD. (Optical ports 9 and 10 are the defaults.

Configuration example

Sample configurations with IE Switch X-300, SIMATIC S7-200/300/400, operator control and monitoring system, H system, and PC as end devices.

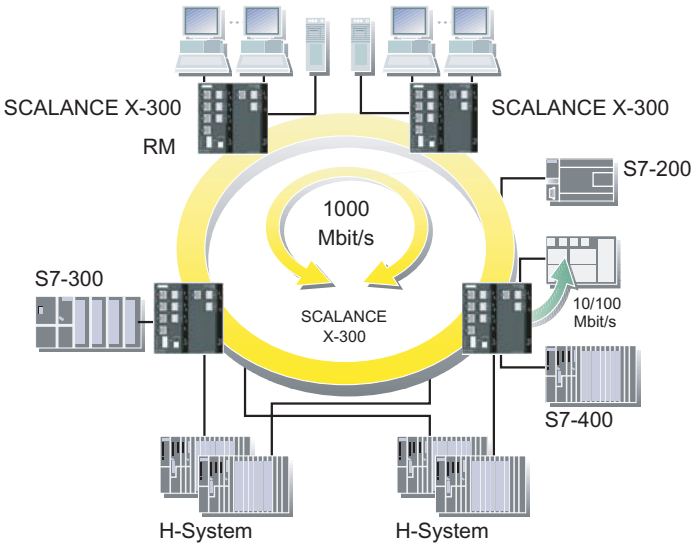


Figure 2-3 Gigabit ring with redundancy manager (RM)

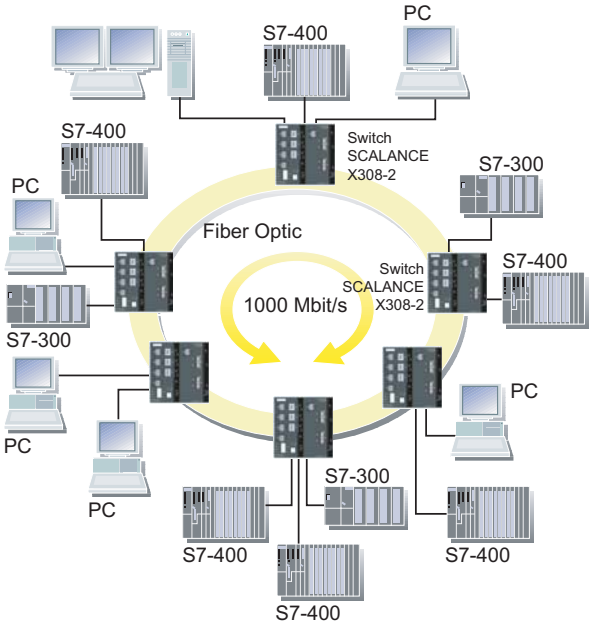


Figure 2-4 Ring with FO cable and redundancy manager

2.1.4 Redundant coupling of network segments

Redundant coupling of network segments

The example of the redundant linking of two network segments shown here, for example rings with redundancy manager, can be implemented homogeneously with SCALANCE X310 or SCALANCE X308-2 or mixed with SCALANCE X310 and SCALANCE X308-2.

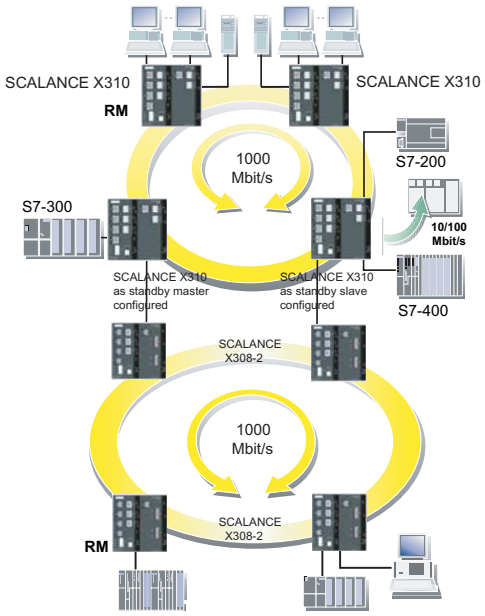


Figure 2-5 Redundant coupling of two subnets in mixed operation with SCALANCE X310 and SCALANCE X308-2

In this case, network segments are rings with a redundancy manager (RM). The rings can also be interrupted at one point (linear topology).

For a redundant link as shown in the figure, two IE Switches X-300 must be configured within a network segment. This configuration is set in Web Based Management, Command Line Interface or using SNMP access. For more detailed information, refer to the "Configuration Manual SCALANCE X-300 and SCALANCE X-400 Industrial Ethernet Switches". The two IE Switches X-300 connected in the configuration exchange data frames with each other to synchronize their operating statuses (one device is master and the other slave). If there are no problems, only the link from the master to the other network segment is active. If this link fails (for example due to a link-down or a device failure), the slave activates its link as long as the problem persists.

Note

If IE Switches X-300 or SCALANCE X408-2 devices are used exclusively for redundant coupling of the gigabit rings, the coupling links can also be designed with a gigabit transmission rate.

2.2 Description of the SCALANCE X-300 product line

2.2.1 Components of the product

Table 2-1 Overview of the components supplied

Device type SCALANCE	Device	2-pin plug-in terminal block	4-pin plug-in terminal block	Product information	Product CD
X310	+	+	+	+	+
X308-2	+	+	+	+	+
X308-2LD	+	+	+	+	+

2.2.2 Unpacking and checking

Unpacking, checking

1. Make sure that the package is complete.
2. Check all the parts for transport damage.

Warning

Do not use any parts that show evidence of damage!

2.2.3 Power supply and signaling contact

Power supply

The power supply is connected using a 4-pin plug-in terminal block.

The power supply can be connected redundantly. Both inputs are isolated. There is no distribution of load. When a redundant power supply is used, the power supply unit with the higher output voltage supplies the IE Switch X-300 alone. The power supply is connected over a high resistance with the enclosure to allow an ungrounded set up. The two power inputs are non-floating.

Signaling contact

The signaling contact (relay contact) is a floating switch with which error/fault states can be signaled by breaking the contact.

The signaling contact is connected to a 2-pin plug-in terminal block.

The signaling by the signaling contact is synchronized with the fault LED, in other words, all errors displayed by this LED (freely configurable) are also signaled on the signaling contact.

If an internal fault occurs, the fault LED lights up and the signaling contact opens.

The connection or disconnection of a communication node on an unmonitored port does not lead to an error message.

The signaling contact remains activated until the error/fault is eliminated or until the current status is entered in the fault mask as the new desired status.

2.2.4 Ethernet interfaces electrical ports

2.2.4.1 10Base-T / 100Base-TX

Transmission rate

The transmission rate of the electrical ports is 10 Mbps or as Fast Ethernet ports 100 Mbps.

Transmission mode

The transmission mode for 10Base-T / 100Base-TX is specified in the IEEE 802.3i / IEEE 802.3u standards of the Institute of Electrical and Electronic Engineers.

Autonegotiation (automatic detection of the best transmission modes) is default. The order in which they are selected is:

- 100Base-TX full duplex
- 100Base-TX half duplex
- 10Base-T full duplex
- 10Base-T half duplex

Two communication modes are possible:

- Half duplex
  Two-way alternate transmission mode - it is only possible to either send or receive over the interfaces at any one time.
- Full duplex mode
  Two-way simultaneous - both communication partners can send and receive at the same time.

Connections to other switches can use half or full duplex; connections to hubs are possible only in half duplex mode.

Transmission medium

Data transmission at 10 Mbps and at 100 Mbps is over two wire pairs (pin 1, 2, 3, 6) of the twisted pair cable. For 10 Mbps, at least a category 3 (Cat 3) and for 100 Mbps, at least a four-wire (2x2) category 5 (Cat 5) cable is necessary.

Transmission range

The maximum transmission range (segment length) is 100 m.

Connectors

The connectors used are 8-pin RJ-45 jacks with securing collars. The securing collar in conjunction with the cover ensures a flush fit and the locking mechanism with the PROFINET-compliant male connectors IE FC RJ-45 Plug 180 and IE FC RJ-45 Plug 145 provides a rugged node attachment suitable for an industrial environment that provides strain and bending relief for the RJ-45 jack.

2.2.4.2 1000Base-TX

Transmission rate

The transmission rate of the electrical Ethernet ports is 10 Mbps, as Fast Ethernet ports 100 Mbps or as gigabit ports 1 Gbps.

Transmission mode

The transmission mode for 1000Base-TX is specified in the IEEE 802.3ab standard.

Autonegotiation (automatic detection of the best transmission modes) is default.
The order in which they are selected is:

- 1000Base-TX full duplex
- 1000Base-TX half duplex
- 100Base-TX full duplex
- 100Base-TX half duplex
- 10Base-T full duplex
- 10Base-T half duplex

Two communication modes are possible:

- Half duplex
  Two-way alternate transmission mode - it is only possible to either send or receive over the interfaces at any one time.
- Full duplex mode
  Two-way simultaneous - both communication partners can send and receive at the same time.

Transmission medium

Data is transmitted over an eight-wire twisted pair cable.

Notice

For data transmission at 1 Gbps, at least a Cat 5e twisted-pair cable with 4 x 2 wires is necessary. With a four-wire cable (2 x 2 wires), a maximum data transmission rate of 100 Mbps is possible.

Transmission range

The maximum transmission range (segment length) is 100 m.

Connectors

The connectors used are 8-pin RJ-45 jacks.

2.2.5 Ethernet interfaces optical ports

2.2.5.1 1000Base-SX

Transmission rate

The transmission rate of the optical gigabit ports is 1 Gbps.

Transmission mode

Transmission with 1000Base-SX is defined in the IEEE 802.3z standard and is specified as 1000 Mbps transmission rate and full duplex.

Transmission medium

Data is transmitted over multimode FOC. The wavelength is 850 nm.

The core diameter of the multimode FOC is 50 µm; the light source is an LED. Many modes (light beams) are used for signal transmission. The propagation times of the light pulses (dispersion) restrict the maximum range considerably.

Transmission range

The maximum transmission range (segment length) is 750 m when using SIMATIC NET fiber-optic multimode FOC with SC duplex connectors.

Connectors

SC duplex female connectors are used.

2.2.5.2 1000Base-LX

Transmission rate

The transmission rate of the optical gigabit ports is 1 Gbps.

Transmission mode

Transmission with 1000Base-LX is defined in the IEEE 802.3z standard and is specified as 1000 Mbps transmission rate and full duplex.

Transmission medium

Data is transmitted over single mode FOC. The wavelength is 1310 nm.

The core diameter of the single mode FOC is 9 or 10 µm; the light source is a laser diode. To transmit a signal, only one mode (light beam) is used greatly reducing dispersion. As a result, the maximum range of single mode FOC is greater than that of multimode FOC.

Transmission range

The maximum transmission distance (segment length) is 10 km for 1000Base-LX transmission.

Connectors

SC duplex female connectors are used.

2.2.6 C-PLUG (configuration plug)

Area of application

The C-PLUG is an exchangeable medium for storage of the configuration data of the IE Switch and ships with the product. This means that the configuration data remains available if the IE Switch is replaced.

Notice

The C-PLUG must only be removed or inserted when the power supply to the device is turned off.

How it works

Power is supplied by the IE Switch. The C-PLUG retains all data permanently when the power is turned off.

If an empty C-PLUG (factory settings or deleted with the Clean function) is inserted, all the configuration data of the IE Switch is saved to it automatically when the device starts up. Changes to the configuration during operation without operator intervention are saved on the C-PLUG if this is in the "ACCEPTED" status.

An IE Switch with an accepted C-PLUG inserted uses the configuration data of the C-PLUG automatically when it starts up. Acceptance is possible only when the data was written by a compatible device type.

This allows an IE Switch to be replaced quickly and simply. The C-PLUG is taken from the failed component and inserted in the replacement. The first time it is started up, the replacement device has the same configuration as the failed device except for the MAC address set by the vendor.

Diagnostics

Inserting a C-PLUG that does not contain the configuration of a compatible device type, accidentally removing the C-PLUG or general malfunctions of the C-PLUG are signaled by the diagnostics mechanisms of the IE Switch (LEDs, WEB-based management, SNMP, CLI and PROFINET diagnostics).

Inserting in the C-PLUG slot

The slot for the C-PLUG is located on the back of the device.

To insert the C-PLUG, remove the screw cover. The C-PLUG is inserted in the receptacle. The screw cover must then be closed correctly.

Removing the C-PLUG

It is only necessary to remove the C-PLUG if the IE Switch develops a fault.

The C-PLUG can be removed from the slot using flat pliers, tweezers, or a small screwdriver.

Figure 2-6 Removing the C-PLUG from the receptacle

2.2.7 Compatibility of SCALANCE X-300

Compatibility list

The following products and devices are compatible with IE Switches X-300:

- End devices
  All SIMATIC NET products with a TP port can be connected to the ports of IE Switches X-300.
- Network components in linear or star structure
  ESM/OSM
  OMC (TP cable max. 6 m long)
  SCALANCE X005
  SCALANCE X-100
  SCALANCE X-100 medium converter
  SCALANCE X-200
  SCALANCE X-200IRT
  SCALANCE X-300
  SCALANCE X-400
  SCALANCE S-600
  SCALANCE W-700

- Network components in a ring structure with IE Switches X-300 a RM
  - Ring structure electrical
    (All IE Switches X-300 possible, it may be necessary to reconfigure ring ports):
    ESM/OSM
    SCALANCE X-200
    SCALANCE X-200IRT
    SCALANCE X-300
    SCALANCE X-400
  - Optical ring structure
    (possible only with SCALANCE X308-2, X308-2LD):
    SCALANCE X-400
    SCALANCE X-300
- Redundant coupling of networks.
  - In the network segment with the master-slave pair of devices to be configured:
    SCALANCE X-400
    SCALANCE X-300
    on the standby link also to SCALANCE X-200
  - In the network segment to be coupled:
    ESM/OSM
    SCALANCE X-200
    SCALANCE X-200IRT
    SCALANCE X-300
    SCALANCE X-400

Note

All compatibility information assumes the correct use of the TP and FOC cables.

2.3 Product variants

2.3.1 SCALANCE X310

Possible attachments

The SCALANCE X310 has 10 RJ-45 jacks for the connection of end devices or other network segments. Seven of these are Fast Ethernet ports (P1 - P7) located on the left of the device and three are gigabit Ethernet ports (P8 - P10) on the right.

Figure 2-7 SCALANCE X310

2.3.2 SCALANCE X308-2

Possible attachments

The SCALANCE X308-2 has 8 RJ-45 jacks and 2 FO ports for the connection of end devices or other network segments. Seven of these are Fast Ethernet ports (P1 - P7) located on the left of the device and one gigabit Ethernet port (P8) and two optical gigabit ports (P9 and P10) on the right.

Figure 2-8 SCALANCE X308-2

2.3.3 SCALANCE X308-2 LD

Possible attachments

The SCALANCE X308-2 LD has 8 RJ-45 jacks and 2 FO ports for the connection of end devices or other network segments. Seven of these are Fast Ethernet ports (P1 - P7) located on the left and one gigabit Ethernet port (P8) and two optical gigabit ports (P9 and P10) on the right.

Figure 2-9 SCALANCE X308-2 LD

Installation

3

3.1 Installation

Types of installation

IE Switches X-300 can be installed in various ways:

- Installation on a 35 mm DIN rail
- Installation on a SIMATIC S7-300 standard rail
- Wall mounting

Note

When installing and operating the device, keep to the installation instructions and safety-related notices as described here and in the manual SIMATIC NET Industrial Ethernet Twisted Pair and Fiber Optic Networks /1/.

Unless stated otherwise, the mounting options listed below apply to all IE Switch X-300.

Note

Provide suitable shade to protect the IE Switch X-300 against direct sunlight. This avoids unnecessary warming of the IE Switches X-300 and prevents premature aging of the IE Switch X-300 and cabling.

Warning

If temperatures in excess of 70 °C occur on cables or at cable feed-in points, or the temperature at the branching point of the cables exceeds 80 °C, special measures need to be taken. If the equipment is operated at an ambient temperature of 50 °C - 60 °C, use cables with a permitted ambient temperature of at least 80 °C.

3.2 Installation on a DIN rail

Caution

If the IE Switch -300 is liable to be subjected to severe vibration (> 10 g), use the S7-300 standard rail for installation. The DIN rail does not provide adequate support if vibration exceeds 10 g.

Installation

Install the IE Switch X-300 on a 35 mm DIN rail complying with DIN EN 50022.

1. Place the upper catch of the IE Switch X-300 over the top of the DIN rail and then push in the lower part of the device against the rail until it clips into place.
2. Fit the connectors for the power supply.
3. Fit the connectors for the signaling contact.
4. Insert the terminal blocks into the sockets on the IE Switch X-300.

Figure 3-1 IE Switch X-300 installation on a DIN rail (35 mm)

Uninstalling

To remove an IE Switch X-300 from the DIN rail:

1. First disconnect all connected cables.
2. Use a screwdriver to release the lower DIN rail catch of the IE Switch X-300 and pull the lower part of the IE Switch X-300 away from the rail.

Figure 3-2 IE Switch X-300 removing from a DIN rail (35 mm)

3.3 Installation on a standard rail

Installation on a SIMATIC S7-300 standard rail

1. Place the upper guide at the top of the IE Switch X-300 housing in the S7 standard rail.
2. Screw the IE Switch X-300 to the underside of the standard rail.
3. Fit the connectors for the power supply.
4. Fit the connectors for the signaling contact.
5. Insert the terminal blocks into the sockets on the IE Switch X-300.

Figure 3-3 IE Switch X-300 installation on a SIMATIC S7-300 standard rail

Uninstalling

To remove an IE Switch X-300 from the SIMATIC S7-300 standard rail:

1. First disconnect all connected cables.
2. Loosen the screws on the underside of the S7 standard rail and lift the IE Switch X-300 away from the rail.

3.4 Wall mounting

Wall mounting

1. For wall mounting, use suitable mounting fittings for the wall (for example, for a concrete wall, four plugs 6 mm diameter and 30 mm long, 4 screws 3.5 mm diameter and 40 mm long).
2. Connect the electrical cable connecting cables.
3. Fit the connectors for the signaling contact.
4. Insert the terminal blocks into the sockets on the IE Switch X-300.

For more exact dimensions, please refer to the section "Dimension drawings".

Note

The wall mounting must be capable of supporting at least four times the weight of the IE Switch X-300.

Connecting

4

Warning

Commissioning devices and replacement devices

If you use redundancy mechanisms (HSR ring redundancy and/or redundant coupling of rings over standby), open the redundant path before you insert a new or replacement device in an operating network. A bad configuration or attachment of the Ethernet cables to incorrectly configured ports causes overload in the network and a breakdown in communication.

A device may only be inserted in a network and connected when:

- HSR:
  The ring ports of the device being inserted in the HSR ring were actually configured as ring ports and "Ring redundancy enabled" was set. (Refer to the "Configuration manual SCALANCE X-300 X-400, section X-300 Ring Configuration"). If the device is intended to operate as the redundancy manager, "Redundancy manager enabled" must also be set. (Refer to the "Configuration manual SCALANCE X-300 X-400, section X-300 Ring Configuration").
- Standby coupling:
  The standby connection must be "enabled" and the "Standby connection name" must match the name of the partner device. You must also select the port in "Enable standby port monitoring". (Refer to the "Configuration manual SCALANCE X-300 X-400, section X-300 Standby Mask").

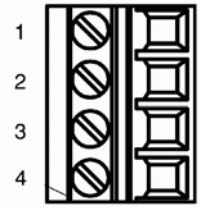
4.1 Power supply

Power supply

The power supply is connected using a 4-pin plug-in terminal block.

The power supply can be connected redundantly. Both inputs are isolated. There is no distribution of load. When a redundant power supply is used, the power supply unit with the higher output voltage supplies the IE Switch X-300 alone. The power supply is connected over a high resistance with the enclosure to allow an ungrounded set up. The two power inputs are non-floating.

Table 4-1 Pin assignment for the power supply

Pin number	Assignment
	
Pin 1	L1+ 24 V DC
Pin 2	M1
Pin 3	M2
Pin 4	L2+ 24 V DC

Warning

The IE Switch X-300 is designed for operation with safety extra-low voltage (SELV). This means that only safety extra-low voltages (SELV) complying with IEC950/EN60950/ VDE0805 can be connected to the power supply terminals.

The power supply unit for the IE Switch X-300 power supply must meet NEC Class 2, as described by the National Electrical Code(r) (ANSI/NFPA 70).

The power of all connected power supply units must total the equivalent of a power source with limited power (LPS limited power source).

If the device is connected to a redundant power supply (two separate power supplies), both must meet these requirements.

The signaling contact can be subjected to a maximum load of 100 mA (safety extra-low voltage (SELV), 24 V DC).

Never operate the device with AC voltage or DC voltage higher than 32 V DC.

Caution

If IE Switches X-300 are supplied over long 24 V power supply lines or networks, measures are necessary to prevent interference by strong electromagnetic pulses on the supply lines. These can result, for example, due to lightning or switching of large inductive loads.

One of the tests used to attest the immunity of devices of the IE Switches X-300 to electromagnetic interference was the "surge immunity test" according to EN61000-4-5. This test requires overvoltage protection for the power supply lines. A suitable device is, for example, the Dehn Blitzductor VT AD 24 V type no. 918 402 or comparable protective element.

Manufacturer: DEHN+SÖHNE GmbH+Co.KG, Hans-Dehn-Str.1, Postfach 1640, D-92306 Neumarkt, Germany.

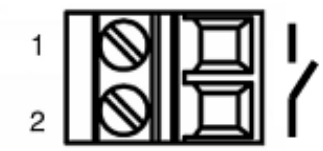
4.2 Signaling contact

Signaling contact

The signaling contact (relay contact) is a floating switch with which error/fault states can be signaled by breaking the contact.

The signaling contact is connected to a 2-pin plug-in terminal block.

Table 4-2 Pin assignment of the signaling contact

IE Switch X-300	
Pin number	**Assignment**
	
Pin 1	F1
Pin 2	F2

The signaling by the signaling contact is synchronized with the fault LED, in other words, all errors displayed by this LED (freely configurable) are also signaled on the signaling contact.

If an internal fault occurs, the fault LED lights up and the signaling contact opens.

The connection or disconnection of a communication node on an unmonitored port does not lead to an error message.

The signaling contact remains activated until the error/fault is eliminated or until the current status is entered in the fault mask as the new desired status.

4.3 Grounding

Installation on a DIN rail

The device is grounded over the DIN rail.

S7 standard rail

The device is grounded over its rear panel and the neck of the screw.

Wall mounting

The device is grounded by the securing screw in the unpainted hole.

Please note that IE Switches X-300 must be grounded over one securing screw with minimum resistance.

If an IE Switch X-300 is mounted on a non-conducting base, a grounding cable must be installed. The grounding cable is not supplied with the device. Connect the paint-free surface of the IE Switch X-300 to the nearest grounding point using the grounding cable.

4.4 Fitting the IE FC RJ-45 Plug

Assembly of the IE FC RJ-45 Plug on an IE FC Standard Cable

For information on assembling an IE FC RJ-45 Plug on a SIMATIC NET Industrial Ethernet FastConnect cable, please refer to the instructions supplied with the IE FC RJ-45 Plug.

Inserting the IE FC RJ-45 Plug

1. Insert the IE FC RJ-45 Plug until it locks in place in the twisted pair port of the IE Switch (on a 1000 Mbps gigabit Ethernet port, the RJ-45 plug can only be used for 100 Mbps).

Figure 4-1 Inserting the IE FC RJ-45 Plug (based on the example of the IE FC RJ-45 Plug 180)

The flush fit and locking mechanism of the PROFINET-compliant IE FC RJ-45 Plug along with the securing collar on the TP port of the IE Switch guarantee a robust node connection suitable for industrial conditions providing tensile and bending strain relief for the twisted pair socket.

Removing the IE FC RJ-45 Plug

1. Press on the locking mechanism of the IE FC RJ-45 Plug gently to remove the plug.

Figure 4-2 Releasing the RJ-45 plug (based on the example of the IE FC RJ-45 Plug 180)

If there is not enough space to release the lock with your hand, you can also use a 2.5 mm screwdriver. You can then remove the IE FC RJ-45 Plug from the twisted pair socket.

Figure 4-3 Releasing the RJ-45 plug with a screwdriver (based on the example of the IE FC RJ-45 Plug 180)

Planning/Configuring

5

5.1 Operator controls

5.1.1 SELECT / SET button

SELECT / SET button

The SELECT / SET button is used to switch over the display modes (DMode) and to make other settings. After turning on the IE Switch X-300, it is in DMode A.

The button has the following functions:

- Changing the display modes
  By pressing the button briefly, you change from one display mode to the next. The selected mode or current status is displayed by the LED (DM).
- Resetting to the factory defaults
  It is possible to restore the factory defaults in DMode A. by pressing the button for 12 seconds. You can cancel the reset procedure by releasing the button before the 12 seconds have elapsed. All previously made settings are overwritten by the factory defaults.
- Defining the fault mask and the LED displays
  It is possible to set the fault mask in DMode A and DMode D. This allows you to specify the mask for signaling faults by defining an individual "good status“ for the connected ports and the power supplies. In this case, you press the button for 5 seconds in DMode A or DMode D. After 3 seconds, the LED (DM) begins to flash. You can cancel the procedure by releasing the button before the 5 seconds have elapsed. If, however, you press the button for a further 2 seconds, the current states of all ports and the states of the power supplies L1 and L2 are included in the fault mask. The previous fault mask is then overwritten.
- Activating/deactivating the redundancy manager
  It is only possible to activate/deactivate the RM in DMode B. by pressing the button for 5 seconds. After 3 seconds, the LED (DM) begins to flash. If you release the button before the 5 seconds have elapsed, the action is aborted. After 5 seconds the redundancy manager is activated/deactivated. If the redundancy manager as well as ring redundancy were deactivated, ring redundancy is also activated at the same time. If you deactivate, only the redundancy manager is deactivated.

5.2 LED display

5.2.1 LED display

Overview

The following table shows the states indicated by the LEDs in the various display modes.

	LED	Display mode A	Display mode B	Display mode C	Display mode D
IE Switch X-300	F	Problem, signaling contact opens			
	L1	Power supply L1 is applied.			Power supply L1 is monitored
	L2	Power supply L2 is applied.			Power supply L2 is monitored
	RM	Device is operating as RM			
	SB	Device operates in standby mode.			
	DM	off	Lit green	Lit orange	Flashes orange/yellow
	P1 P2 P3 P4 P5 P6 P7 P8 P9 P10	Port status	Transmission rate	Half / full duplex	Fault mask

5.2.2 Startup behavior of the SCALANCE X-300

Startup behavior of the IE Switch X-300

While the device is starting up, the red LED "F" signals the current status of the IE Switch X-300. You will find more detailed information in the following table:

	LED on	LED off	LED flashing
During device startup	IE Switch X-300 starts or there is a fault	Device startup successful	Bad firmware image
During operation	Fault/error detected	Operation not OK	

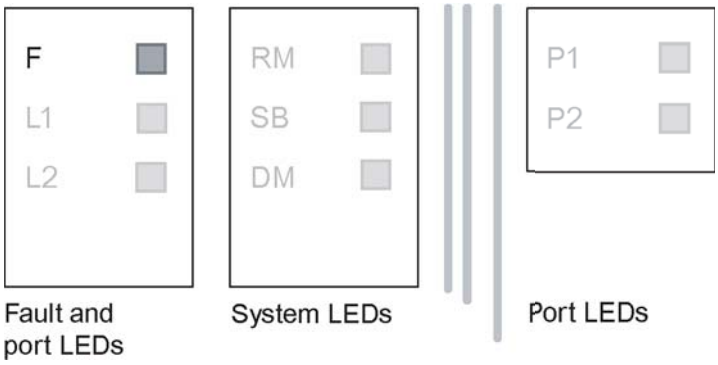


Figure 5-1 Fault LED

5.2.3 Selecting the display modes

Selecting the display modes

Press the SELECT/SET button on the IE Switch X-300 until the DM LED lights up in the required mode. The selected display mode is then activated.

There is an automatic switchover to Dmode A if the button is not pressed for longer than one minute.

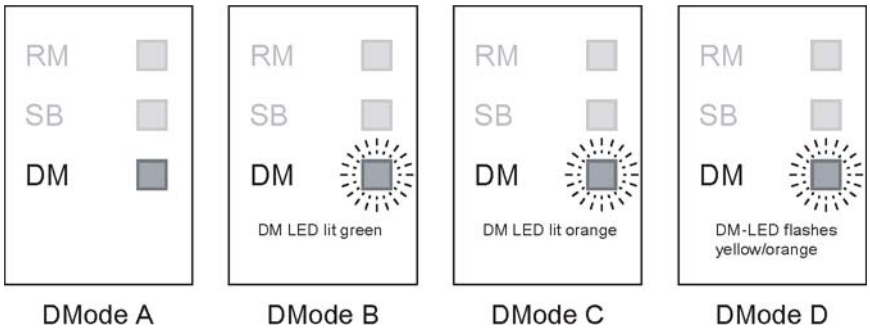


Figure 5-2 Displaying the four possible display modes

5.2.4 LED display - Fault and Power

Display modes A through C

In display modes A through C, the DM LED is lit as described in the section *Selecting the display modes*. In these three states, the status of the signaling contact and the presence of the supply voltages are displayed by the LEDs of the IE Switch X-300.

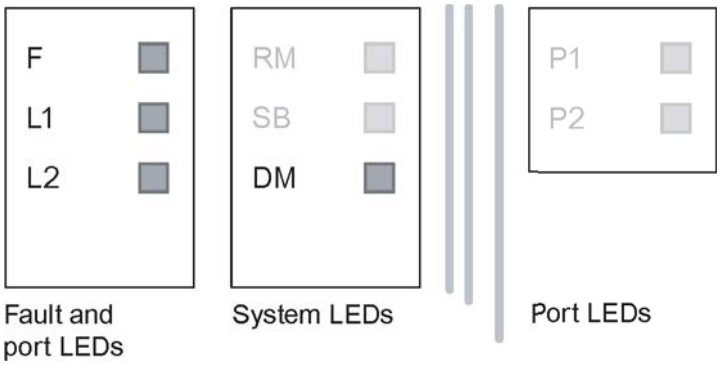


Figure 5-3 Example of the LED display of the device in DMode A

The following table lists the significance of the three LEDs on the IE Switch X-300 for display modes A through C:

Label	Color	Status	Meaning
F		off	The IE Switch X-300 has not detected any faults, the signaling contact is closed.
	Red	on	The IE Switch X-300 has detected a fault, the signaling contact opens.
L1		off	Power supply L1 lower than 17 V.
	Green	on	Power supply L1 higher than 17 V.
L2		off	Power supply L2 lower than 17 V.
	Green	on	Power supply L2 higher than 17 V.

Display in display mode D

In display mode D, the DM LED of the IE Switch X-300 flashes yellow/orange. This mode indicates whether the power supply is being monitored with the signaling contact.

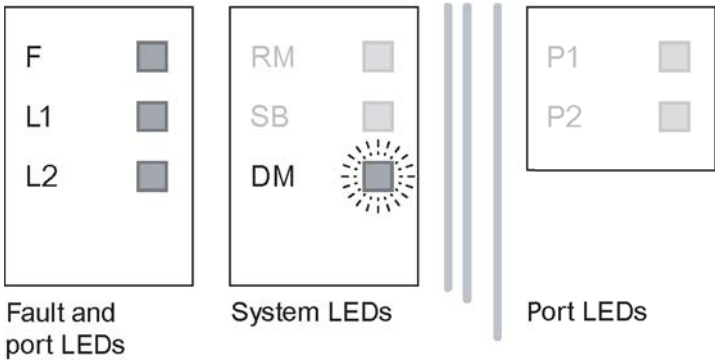


Figure 5-4 LED Fault / Power and System display in display mode D

The following table shows the meaning of the three LEDs on the IE Switch X-300 in display mode D:

Label	Color	Status	Meaning
F		off	No problem has been detected by the IE Switch X-300.
	Red	on	The IE Switch X-300 detects a fault. The signaling contact opens.
L1		off	Power supply L1 is not monitored. If L1 falls below 17 V, the signaling contact does not respond.
	Green	on	Power supply L1 is monitored. If L1 falls below 17 V, the signaling contact responds.
L2		off	Power supply L2 is not monitored. If L2 falls below 17 V, the signaling contact does not respond.
	Green	on	Power supply L2 is monitored. If L2 falls below 17 V, the signaling contact responds.

5.2.5 LED display - System

System

On the IE Switch X-300, the LEDs of the system are on the right-hand LED strip.

Display modes A through D

The set display modes are indicated as follows:

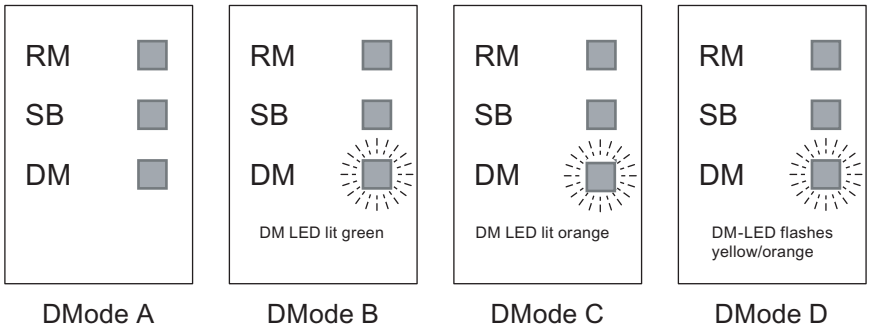


Figure 5-5 Display of the possible display modes (DMode A through DMode D)

The individual functions (RM, SB and DM) are independent of each other. The LED displays are described below:

Label	Color	Status	Meaning
RM		off	The IE Switch X-300 is not operating in redundancy manager mode.
	Green	on	The IE Switch X-300 is operating in redundancy manager mode. The ring is working without problems, monitoring is activated.
		flashes	The IE Switch X-300 is operating in redundancy manager mode. An interruption has been detected on the ring; the IE Switch X-300 has switched through.
SB		off	The standby function is disabled.
	Green	on	The standby function is enabled. The standby link is passive.
		flashes	The standby function is enabled. The standby link is active.
DM		off	Mode A
	Green	on	Mode B
	Orange	on	Mode C
	Yellow/orange	flashes	Mode D

5.2.6 LED display of the ports (DMode A through DMode D)

LEDs of the ports

The LED displays of the 10 ports indicate different port states depending on the set display mode. The displays have the same meaning for all ports.

Port statuses in DMode A

In display mode A, the current port status is displayed.

Port	Color	Status	Meaning
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10		off	No valid link to the port (for example station turned off or cable not connected)
	Green	on	Link exists and port in normal status. In this status, the port can receive and send data.
		flashes once per period	Link exists and port in "blocking" status. In this status, the port only receives management data (no user data).
		flashes three times per period	Link exists and port turned off by management. In this status, no data is sent or received over the port.
		flashes four times per period	Port exists and is in the "monitor port" status. In this status, the data traffic of another port is copied to this port.
	Yellow	Flashes / lit	Link exists, port is in normal status and data is being received at the port. The optical gigabit ports of the IE Switch X-300 signal data reception and data transmission.

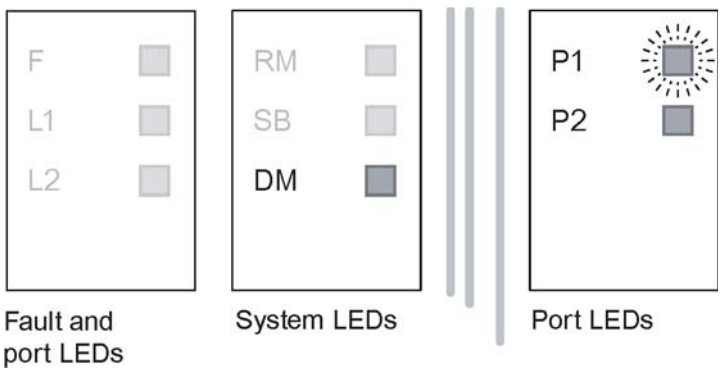


Figure 5-6 Display of the port status of port 1

Port statuses in DMode B

In display mode B, the current transmission rate is displayed.

Port	Color	Status	Meaning
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10		off	Port operating at 10 Mbps
	Green	on	Port operating at 100 Mbps
	Orange	on	Port operating at 1000 Mbps

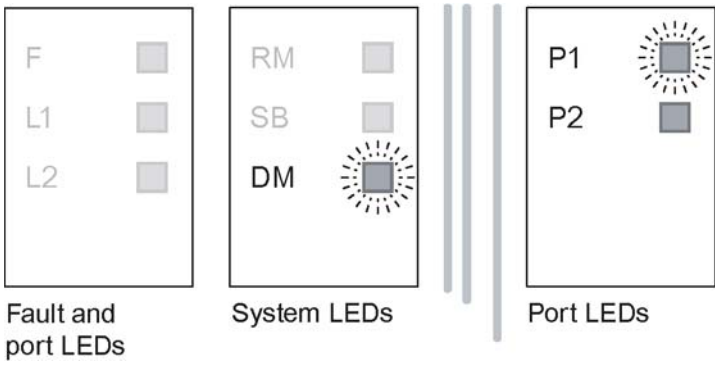


Figure 5-7 Display of the transmission speed of port 1

Note

If there is a link fault and the type of transmission is fixed (autonegotiation off), in DMode B, the desired status, in other words the set transmission rate (1000 Mbps, 100 Mbps, 10 Mbps) continues to be displayed. If there is a link fault and autonegotiation is active, the port LED goes off.

Port statuses in DMode C

In display mode C, the current mode (half duplex, full duplex) is indicated.

Port	Color	Status	Meaning
P1		off	Port operating in half duplex
P2 P3 P4 P5 P6 P7 P8 P9 P10	Green	on	Port operating in full duplex

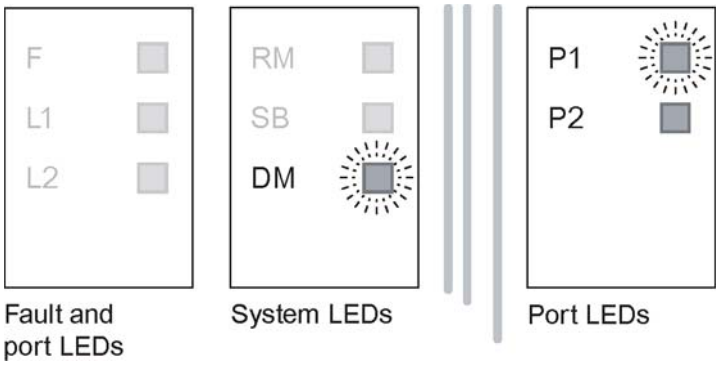


Figure 5-8 Mode display (full / half duplex) of port 1

Note

If there is a link fault and the type of transmission is fixed (autonegotiation off), in DMode C, the desired status, in other words the set type of transmission (full or half duplex) continues to be displayed. If there is a link fault and autonegotiation is active, the port LED goes off.

Port statuses in DMode D

In display mode D, you can see whether or not the port is monitored.

Port	Color	Status	Meaning
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10		off	The port is not monitored; in other words, if a link is not established at the port, this does not trigger the signaling contact.
	Green	on	Port is monitored; in other words, if there is no link established at the port (for example cable not plugged in or connected IE Switch X-300 turned off), this triggers the signaling contact and to a fault state.

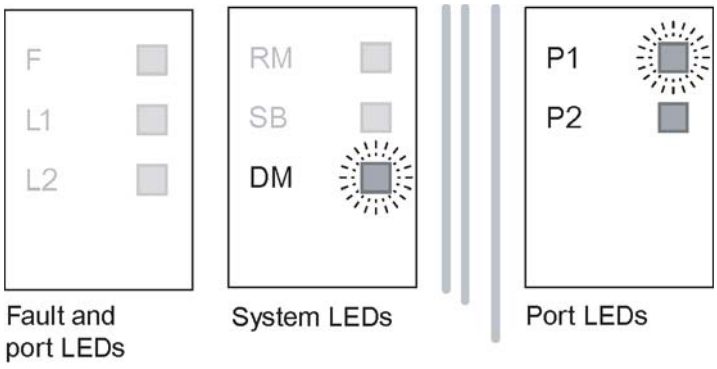


Figure 5-9 Example: Monitoring of port 1 is "on“

5.3 Show Location

Localizing an IE Switches X-300

To identify an IE Switch X-300 locally and with certainty, you can use the "show location" function on a programming device to select the node over the network and make it flash. This can be used, for example, when assigning addresses to make sure that the correct node receives the address. All port LEDs of the addressed node flash green at 2 Hz.

With the PST Tool V3.0 or higher, you can trigger this function with "Module \ Flash".

Certifications and approvals

6

6.1 Approvals, Certificates

Note

The specified approvals apply only when the corresponding mark is printed on the product. You can check which of the following approvals have been granted for your product by the markings on the type plate.

	Order number
IE Switch SCALANCE X310	6GK5 310-0FA00-2AA3
IE Switch SCALANCE X308-2	6GK5 308-2FL00-2AA3
IE Switch SCALANCE X308-2 LD	6GK5 308-2FM00-2AA3

CE mark

SIMATIC NET SCALANCE X-300 Industrial Ethernet switches meet the requirements and aims of the following EU directives and comply with the harmonized European standards (EN) for programmable logic controllers published in the Official Journal of the European Communities:

- Directive 89/336/EEC "Electromagnetic Compatibility" (EMC Directive)
- Directive 73/23/EEC ”Electrical Equipment Designed for Use within Certain Voltage Limits” (Low Voltage Equipment Directive)
- Directive 94/9/EEC Equipment and Protective Systems intended for Use in Potentially Explosive Atmospheres (Explosion Protection Directive).

The EC Declarations of Conformity are available for the responsible authorities according to the above-mentioned EC Directive at the following address:

Siemens Aktiengesellschaft
Bereich Automatisierungs- und Antriebstechnik
Industrielle Kommunikation SIMATIC NET
Postfach 4848

D-90327 Nürnberg, Germany

EMC directive

The products are designed for use in an industrial environment:

Area of application	Requirements	
	Emission	Immunity
Industrial area	EN 61000-6-4 : 2001	EN 61000-6-2: 2001

Explosion protection directive

Complying with EN 60079-15 (electrical apparatus for potentially explosive atmospheres; Type of protection “n”)
II 3 G EEx nA II T 4 KEMA 03 ATEX 1226X

Note

When using (installing) SIMATIC NET products in hazardous area zone 2, make absolutely sure that the associated conditions are adhered to.

You will find these conditions on the SIMATIC NET Manual Collection.

FDA and IEC approvals

The following device meets the FDA and IEC requirements listed below

- SCALANCE X308-2 LD

Figure 6-1 FDA and IEC approvals

Machinery directive

The product remains a component in compliance with Article 4(2) of the EC Machinery Directive 89/392/EEC.

According to the machinery directive, we are obliged to point out that the product described is intended solely for installation in a machine.

Before the final product can be put into operation, it must be tested to ensure that it conforms with the directive 89/392/EEC.

Note for the manufacturers of machines

This product is not a machine in the sense of the EC Machinery Directive. There is therefore no declaration of conformity relating to the EC Machinery Directive 89/392/EEC for this product.

If the product is part of the equipment of a machine, it must be included in the procedure for obtaining the declaration of conformity by the manufacturer of the machine.

Installation guidelines

The products meet the requirements if you adhere to the installation and safety instructions contained in these Operating Instructions SIMATIC NET Industrial Ethernet Switches SCALANCE X-300 and in the following documentation:

SIMATIC NET Industrial Twisted Pair and Fiber Optic Networks Manual /2/

This documentation is available on the Internet at the address
http://support.automation.siemens.com/WW/view/xx/8763736
(xx = German 00, English 76, French 77, Italian 72, Spanish 78)

Warning

Personal injury and damage to property may occur.

The installation of expansions that are not approved for SIMATIC NET products or their target systems may violate the requirements and regulations for safety and electromagnetic compatibility.

Only use expansions that are approved for the system.

Notice for Australia (C-TICK)

The product meets the requirements of the AS/NZS 2064 standard (Class A).

UL Approval for Information Technology Equipment

Underwriters Laboratories (UL) complying with Standard UL 60950-1

Report Number E115352

UL Approval for Industrial Control Equipment

Underwriters Laboratories (UL) complying with Standard UL 508

Report Number E85972

CSA Approval for Information Technology Equipment

CSA Certification Mark

Canadian Standard Association CSA C22.2 No. 60950-1-03

CSA Approval for Industrial Control Equipment

CSA Certification Mark

Canadian Standard Association CSA C22.2 No. 14-M91

cULus Approval for Information Technology Equipment

cULus Listed 60E9 I. T. E.

Underwriters Laboratories Inc. complying with

- UL 60950-1 (Information Technology Equipment)
- CSA C22.2 No. 60950-1-03

cULus Approval for Industrial Control Equipment

cULus Listed 69B1

Underwriters Laboratories Inc. complying with

- UL 508
- CSA C22.2 No. 14-M91

cULus Approval Hazardous Location

cULus Listed 21BP I. T. E. FOR HAZ. LOC.

Underwriters Laboratories Inc. complying with

- UL 60950-1 (Information Technology Equipment)
- CSA C22.2 No. 60950-1-03
- UL 1604 and 2279-15 (Hazardous Location)

Approved for use in
Cl. 1, Div. 2, GP. A, B, C, D, T4
Cl. 1, Zone 2, GP. IIC T4
Cl. 1, Zone 2, Aex nC IIC T4

FM Approval

The product meets the requirements of the standards

- Factory Mutual Approval Standard Class Number 3611
- FM Hazardous (Classified) Location Electrical Equipment:
  Non Incendive / Class I / Division 2 / Groups A,B,C,D / T4 and
  Non Incendive / Class I / Zone 2 / Group IIC / T4

Note

When used in environments corresponding to Class I, Division 2 or Class I, Zone 2 (see above), the product must be installed in a cabinet, a suitable enclosure, or closed room.

Warning

In hazardous areas, personal injury or damage to property may occur if you make or break an electrical circuit while an IE Switch X-300 is in operation.

Do not connect or disconnect equipment when a flammable or combustible atmosphere is present.

ATEX Approval

The product meets the requirements of the standard

- EN60079-15

Warning

When used under hazardous conditions (zone 2), IE Switches X-300 must be installed in an enclosure.

To comply with ATEX95 (EN 60079-15), this enclosure must meet the requirements of at least IP54 in compliance with EN 60529.

WARNING - EXPLOSION HAZARD: DO NOT DISCONNECT EQUIPMENT WHEN A FLAMMABLE OR COMBUSTIBLE ATMOSPHERE IS PRESENT.

If temperatures in excess of 70 °C occur on cables or at cable feed-in points, or the temperature at the branching point of the cables exceeds 80 °C, special measures need to be taken. If the equipment is operated at an ambient temperature of 50 °C - 60 °C, use cables with a permitted ambient temperature of at least 80 °C.

Protective measures must be taken to avoid the rated voltage of the equipment being exceeded by more than 40% by transient overvoltages. This is the case if the equipment is supplied exclusively by SELV circuits.

Certification

The products and systems listed in this document are manufactured and marketed using a quality management system complying with DIN ISO 9001 and certified by DQS (certificate registration no. 2613). The DQS certificate is recognized in all IQNet countries (Reg. no. 2613).

Devices connected to the system must meet the relevant safety regulations.

The EC Declaration of Conformity is available for the responsible authorities according to the above-mentioned EC Directive at the following address:

Siemens Aktiengesellschaft
Bereich Automatisierungs- und Antriebstechnik
Industrielle Kommunikation SIMATIC NET
Postfach 4848

D-90327 Nürnberg, Germany

This declaration certifies compliance with the directives named above, but does not guarantee any specific properties.

Accessories

7

7.1 Accessories

Table 7-1 Order numbers

	Order number	Available for SCALANCE
"Industrial Ethernet TP and Fiber Optic Networks" manual	6GK1970-1BA10-0AA0	All
IE FC Stripping Tool	6GK1901-1GA00	All
IE FC blade cassettes	6GK1901-1GB00	All
IE FC TP standard cable GP	6XV1840-2AH10	All
IE FC TP trailing cable	6XV1840-3AH10	All
IE FC TP marine cable	6XV1840-4AH10	All
IE FC TP trailing cable GP	6XV1870-2D	All
IE FC TP flexible cable GP	6XV1870-2B	All
IE TP torsion cable	6XV1870-2F	All
IE FC RJ-45 Plug 180 pack of 1	6GK1901-1BB10-2AA0	All
IE FC RJ-45 Plug 180 pack of 10	6GK1901-1BB10-2AB0	All
IE FC RJ-45 Plug 180 pack of 50	6GK1901-1BB10-2AE0	All
C-PLUG	6GK1900-0AB00	SCALANCE X-200/X-300/X-400/W-700
IE SC RJ PCF Plug	6GK1900-0NB00-0AC0	
IE SC RJ POF Plug	6GK1900-0MB00-0AC0	
IE termination kit SC RJ PCF Plug	6GK1900-0NL00-0AA0	
IE termination kit SC RJ POF Plug	6GK1900-0ML00-0AA0	

Technical specifications

8

8.1 Technical specifications

Device type SCALANCE	Dimensions (W x H x D) in mm	Weight in g	Installation options - DIN rail - S7-300 standard rail - Wall mounting
X310	120 x 125 x 123	1400	+
X308-2	120 x 125 x 123	1400	+
X308-2 LD	120 x 125 x 123	1400	+

Table 8-1 Ports

Device type SCALANCE	Attachment of end devices or network components over twisted pair	Connecting end devices or network components over fiber-optic	Connector for power supply	Connector for signaling contact
X310	7 x RJ-45 sockets with MDI-X pinning 10/100 Mbps (half/ full duplex) 3 x RJ-45 sockets with MDI-X pinning 10/100/1000 Mbps (half/ full duplex)	-	1x4-pin plug-in terminal block	1x2-pin plug-in terminal block
X308-2	7 x RJ-45 sockets with MDI-X pinning 10/100 Mbps (half/ full duplex) 1 x RJ-45 socket with MDI-X pinning 10/100/1000 Mbps (half/ full duplex)	2 SC duplex sockets (1000 Mbps, full duplex to 1000BaseSX)	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block
X308-2 LD	7 x RJ-45 sockets with MDI-X pinning 10/100 Mbps (half/ full duplex) 1 x RJ-45 socket with MDI-X pinning 10/100/1000 Mbps (half/ full duplex)	2 SC duplex sockets (1000 Mbps, full duplex to 1000BaseLX)	1 x 4-pin plug-in terminal block	1 x 2-pin plug-in terminal block

Table 8-2 Electrical data

Device type SCALANCE	Power supply 2 x 24 V DC (18-32 V DC) Safety extra-low voltage (SELV)	Power loss at 24 V DC	Current consumption at rated voltage	Overcurrent protection at input Non-replaceable fuse (F 3 A / 32 V)
X310	+	9.6 W	400 mA	+
X308-2	+	9.6 W	400 mA	+
X308-2 LD	+	9.6 W	400 mA	+

Table 8-3 Signaling contact

Device type SCALANCE	Voltage at signaling contact	Current through signaling contact
X310	24 V DC	max. 100 mA
X308-2	24 V DC	max. 100 mA
X308-2 LD	24 V DC	max. 100 mA

Table 8-4 Permitted cable lengths (copper)

Device type SCALANCE	0 - 55 m IE TP torsion cable with IE FC RJ-45 Plug 180 or 0 - 45 m IE TP torsion cable with IE outlet RJ-45 + 10 m TP cord	0 - 85 m IE FC TP marine/trailing/ flexible cable with IE FC RJ-45 Plug 180 or 0 - 75 m IE FC TP marine/ trailing/flexible cable + 10 m TP cord over IE FC outlet RJ-45	0 - 100 m IE FC TP standard cable with IE FC RJ-45 plug 180 or over IE FC outlet RJ-45 with 0 - 90 m IE FC TP standard cable + 10 m TP cord
X310	+	+	+
X308-2	+	+	+
X308-2 LD	+	+	+

Table 8-5 Permitted cable lengths (fiber-optic)

Device type SCALANCE	0 - 750 m glass FOC 50/125 µm multimode fiber; 2.5 dB/km at 850 nm 4.5 dB max. permitted FO cable attenuation with 3 dB link power margin	0 - 10000 m glass FOC 9/125 µm single mode fiber; 0.5 dB/km at 1310 nm; 6 dB max. permitted FO cable attenuation with 3 dB link power margin	0 - 40000 m glass FOC 9/125 µm single mode fiber; 0.4 dB/km at 1310 nm; 18 dB max. permitted FO cable attenuation with 2 dB link power margin	0 - 70000 m glass FOC 9/125 µm single mode fiber; 0.28 dB/km at 1550 nm; 21 dB max. permitted FO cable attenuation with 2 dB link power margin
X310	-	-	-	-
X308-2	+	-	-	-
X308-2 LD	-	+	-	-

Note

Maximum insertion loss of 0.5 dB per SC connector.

Table 8-6 Aging time

Device type SCALANCE	Aging time
X310	30 seconds
X308-2	30 seconds
X308-2 LD	30 seconds

Table 8-7 MTBF

Device type SCALANCE	MTBF
X310	46 years
X308-2	48 years
X308-2 LD	48 years

Table 8-8 Permitted ambient conditions

Device type SCALANCE	Operating temperature	Storage/transport temperature	Relative humidity in operation	Operating altitude at max. xx°C ambient temperature
X310	0 °C through +60 °C	-40 °C through +70 °C	‹ 95 % (no condensation)	2000 m at max. 56 °C 3000 m at max. 50 °C
X308-2	0 °C through +60 °C	-40 °C through +70 °C	‹ 95 % (no condensation)	2000 m at max. 56 °C 3000 m at max. 50 °C
X308-2 LD	0 °C through +60 °C	-40 °C through +70 °C	‹ 95 % (no condensation)	2000 m at max. 56 °C 3000 m at max. 50 °C

Note

The following applies to IE Switches X-300

The number of IE Switches X-300 connected in a line influences the frame propagation time.

When a frame passes through an IE Switch X-300, it is delayed by the Store&Forward function of the IE Switch X-300

- with a 64 byte frame length by approx. 10 microseconds (at 100 Mbps)
- with a 1500 byte frame length by approx. 130 microseconds (at 100 Mbps)

This means that the more IE Switch X-300 devices the frame passes through, the longer the frame delay.

Graphics

9

9.1 Dimension drawing

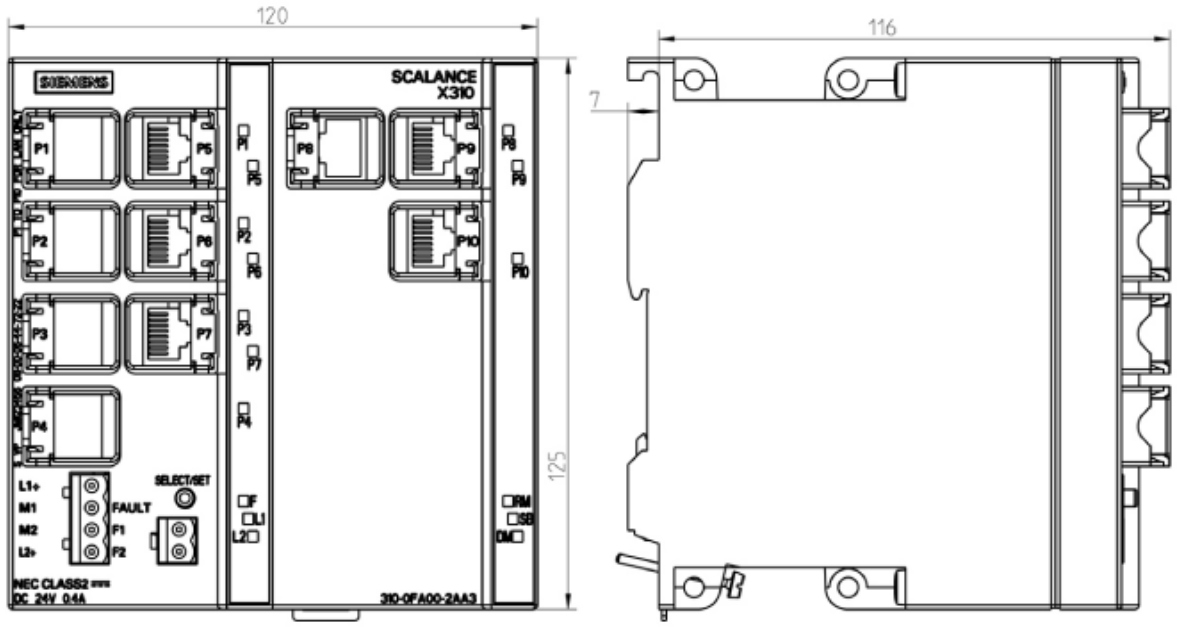


Figure 9-1 SCALANCE X310 dimension drawings

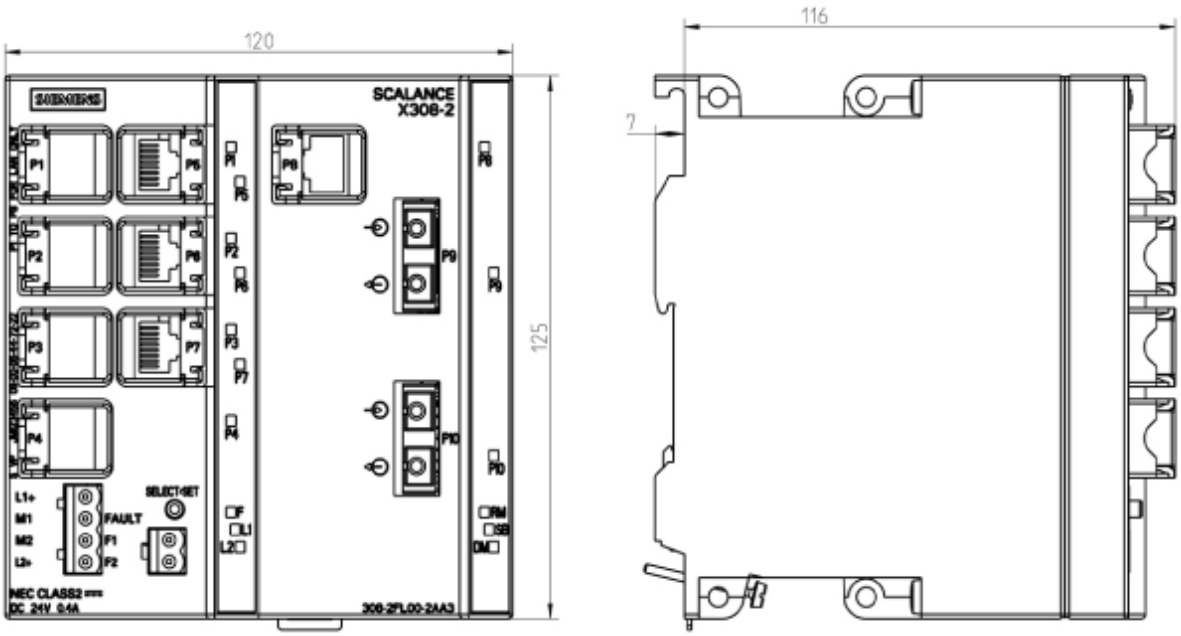


Figure 9-2 SCALANCE X308-2 dimension drawings

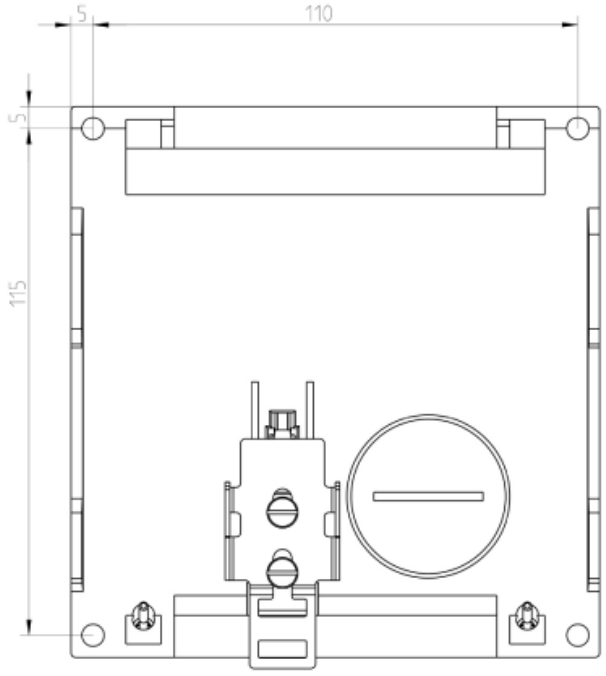


Figure 9-3 Drilling template for the IE Switch X-300

Appendix A

A

A.1 TP port

Connector pinout

On the IE Switch X-300, the TP ports are implemented as RJ-45 jacks with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

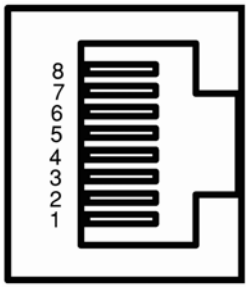


Figure A-1 RJ-45 jack

Table A-1 Pin assignment

Pin number	Pinning of the Fast Ethernet ports all IE-Switches X-300 (P1-P7)	Pinning of the gigabit Ethernet ports on SCALANCE X310 (P8 - P10) on SCALANCE X308-2, X308-2LD (P8)
Pin 8	n. c.	3-
Pin 7	n. c.	3+
Pin 6	TD-	1-
Pin 5	n. c.	2-
Pin 4	n. c.	2+
Pin 3	TD+	1+
Pin 2	RD-	0-
Pin 1	RD+	0+

Notice

TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45 TP port.

With the IE FC cables and IE FC RJ-45 plug, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, network components or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

With devices that do not support autonegotiation, the IE Switch X-300 port must be set manually to the speed and duplexity settings of the device (in other words, the identical setting).

Note

The IE Switch X-300 is a plug-and-play device that does not require settings to be made for commissioning.

MDI /MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user.

The IE Switches X-300 all support the MDI / MDIX autocrossover function.

Note

Autocrossover works only in autonegotiation is enabled. If the setting is fixed, there is no autocrossover (see Glossary).

Notice

Please note that a direct connection between two ports on the IE Switch X-300 or an accidental connection over several IE Switches X-300 can cause illegal formation of loops unless RSTP or STP is activated. Such a loop can lead to network overload and network failures.

Glossary

Aging time

The aging time is the time after which a learned MAC address is discarded if an IE Switch X-300 has not received frames with this sender address during this time.

Autocrossover

Technique with which a TP port is automatically switched over between MDI and MDIX assignment to make a connection independent of the port assignment of the device being attached. This means that crossover cables are not required. The autocrossover function can only be used when the port is set to autonegotiation mode.

Autonegotiation

Procedure standardized by IEEE 802.3 in which the transmission parameters (for example 10/100 Mbps, full/half duplex) are negotiated automatically between the devices.

BOOTP

A protocol for automatic assignment of IP addresses. The IP addresses are provided by a BOOTP server.

CLI

Command Line Interpreter. Terminal-based configuration option for the IE Switch X-300. With TELNET, the CLI can be used over every Ethernet port.

Collision domain

To ensure that the CSMA/CD protocol functions correctly, the propagation time of a data packet from one node to another is restricted. This propagation time results in a spatially limited span for the network depending on the data rate known as the collision domain.

Connection monitoring

With regular link test pulses, IE Switch X-300 monitors the connected TP and FO cable segments for short-circuits or interruptions. The IE Switch X-300 does not send data to a segment from which it is not receiving link test pulses.

C-PLUG

The C-PLUG (configuration plug) is an exchangeable memory medium of storing the configuration data. If the device is replaced, the configuration can be adopted by swapping the C-PLUG.

CRC

Cyclic Redundancy Check. A checksum used in transmission protocols to detect errors in frames.

Cut Through

With this technique, a frame is forwarded as soon as the destination address is recognized. The delay is therefore not dependent on the frame length.

Default gateway

A network node that forwards all frames not addressed to stations in the same LAN (subnet).

DHCP

DHCP (Dynamic Host Configuration Protocol), like BOOTP, a method for automatic assignment of IP addresses. With DHCP, however, addresses can be assigned while the device is operating.

Dispersion

Broadening and distortion of light pulses in fiber-optic cable due to signals arriving at different times. On multimode FOC, the distortion of the output signal is greater than with single mode FOC.

Display mode (DMode)

Display mode that indicates various statuses (port status, power monitoring activated etc.). The modes can be switched over using a button on the IE Switch X-300.

ESM

Electrical **S**witching **M**odule – SIMATIC NET Ethernet switch with electrical ports.

Event

For Alarms & Events: An event is anything that happens that could be of interest to a client. Although events can also be generated when a condition is met, they are not necessarily dependent on conditions. Events that are not linked to conditions include, for example, error messages of the communication system.

Fault mask

Specifies the desired status (good status). Deviations from this occurring during operation are handled as faults.

FO port

Fiber **O**ptic port

Full duplex

Two-way simultaneous - both communication partners can send and receive at the same time.

Half duplex

Two-way alternate transmission mode- it is only possible to either send or receive over the interfaces at any one time.

Latency

Latency specifies the time taken by frames to pass through an IE Switch X-300. This does not include the time required for buffering frames.

Load containment

With its filtering functions, a switch makes sure that local data traffic remains local. The local network load of a segment is contained in the originating segment and does not represent extra load on the remainder of the network.

MDI

Medium **D**ependent **I**nterface, - straight.
On a MDI port or a MDI cable, the receive (Rx) and transmit (Tx) cables are not crossed over.

MDI-X

Medium Dependent Interface – crossover.
On an MDI-X port or MDI-X cable, the receive (Rx) and the send (Tx) lines are crossed over.

MIB

Management **I**nformation **B**ase. The MIB is a formal description of network objects in the form of a tree structure that contains all the relevant information for network management in SNMP.

Mirroring

A port (mirror port) with its specific data traffic can be mirrored to another port (monitor port) for test purposes. Protocol analysis devices can be connected to the monitor port, in other words, the monitor port is not available for data exchange. Mirroring has no effect on the mirror port.

Modes

Modes are discrete waves used to transmit data within a fiber-optic cable. With single mode fibers, only one wave propagates, whereas in multimode fibers several waves propagate. Modes are patterns of electromagnetic fields in FOCs.

Multicast

A frame with a multicast address is received by all nodes prepared to receive this address.

Multimode

In multimode transmission, the pulse is transferred using many modes (waves) that travel along curved paths or are reflected within the core. Attenuation is mainly caused by physical absorption and dispersion as well as by mechanical bending. The amount of attenuation depends among other things on the wavelength of the input light. Multimode fiber-optic cables have an outer diameter of 125 µm and 50 or 62.5 µm core diameter. Due to the larger core diameter the pulse edges degrade more than in single mode transmission resulting in shorter transmission distances.

OSM

Optical Switching Module – SIMATIC NET Ethernet switch with optical ports.

Passive listening

Support of Rapid Spanning Tree Topology Change frames. When an RSTP topology change frame is received, the MAC address table is deleted.

PCF

Polymer Cladded Fiber
Optical fiber that can be assembled in the field and whose core is made of glass and jacket made of plastic.

POF

Plastic Optical Fiber
Optical fiber that can be assembled in the field and whose core and jacket are made of plastic.

Rapid Spanning Tree

The Rapid Spanning Tree protocol (RSTP) allows redundant transmission paths. This prevents circulating frames and, if a fault develops, provides an alternative path within seconds (reconfiguration time).

Reconfiguration time

The time required to restore a functional configuration if a device fails or a network cable is interrupted.

Redundancy manager (RM)

IE Switch X-300 in a ring topology that does not forward any frames between its ring ports if there are functioning connections between all other switches. As soon as a connection between two switches is interrupted, the redundancy manager forwards frames between its ring ports and so restores an intact connection between all switches.

Ring port

Two ports on an IE Switch X-300 via which it is connected to other switches to form a ring. One IE Switch X-300 must be configured as the redundancy manager in the ring. This sends test frames via the ring ports that are forwarded by all the ring ports of the other switches in the ring. This makes sure that the ring does not have any interruptions.

RMON

Remote Monitoring. RMON-compliant devices allow diagnostic data to be collected on the device and read out by a network management station. This means that network problems are detected early and can be eliminated. The particular advantage of RMON is that it is independent of location. The acquired data can be analyzed at any point in the network with suitable reporting software.

Segment

In the Ethernet bus system, transceivers connected together over the bus cable along with the nodes connected over patch cables form a segment. Several such segments can be connected via repeaters. When using twisted pair and fiber-optic cables, each subsection forms a segment.

Signaling contact

Floating relay contact via which the detected error states can be signaled.

Single mode

In single mode transmission, (and monomode transmission) the pulse is transmitted by a straight mode (wave). Attenuation is mainly caused by physical absorption and dispersion as well as by mechanical bending. The amount of attenuation depends, among other things, on the wavelength of the input light. The single mode fiber typically has a core diameter of 5 to 9 µm. The outer diameter is, however, once again 125 µm (compare multimode). The smaller

core diameter degrades the pulse edges less than multimode transmission and allows greater transmission distances.

SNMP

Simple **N**etwork **M**anagement **P**rotocol. Standardized protocol for transporting network management information.

Spanning Tree

The Spanning Tree protocol (STP) allows redundant transmission paths. This prevents circulating frames and, if a fault develops, provides an alternative path within 20 - 30 seconds (reconfiguration time).

Store and forward

In this switching technique, the entire frame is read in, before it is forwarded by the IE Switch X-300. A packet is only passed on if it is error-free.

TELNET

With this protocol, an interactive connection can be established to another device in the LAN or on the Internet. The user then has the same options as when directly connected to this device with a terminal.

TFTP

Trivial File Transfer Protocol. A simple, UDP-based protocol for data transfer. Due to its limited size, it can also be used by network nodes with little ROM.

TP port

Port with a TP connector (RJ-45 jack)

VLAN

Virtual LAN within a physically existing network.

WBM

Web Based Management. With WBM, configuration and diagnostics are handled with an Internet browser. Entries made by the user are sent to the IE Switch X-300 using the HTTP protocol and the IE Switch X-300 transfers its replies by HTTP to the user.

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